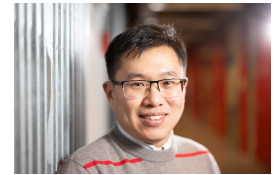


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Personal profile

Dr. Hongyang Cheng specializes in multi-scale modeling of soils and Bayesian uncertainty quantification for geotechnical applications. His research bridges physics-based and data-driven approaches to advance soil mechanics, focusing on granular material behaviors—from quasistatic to free-flowing—and quantifying parameter uncertainties across particle to macro scales. Dr. Cheng serves as an editorial board member for *Soils and Foundations*, a nominated member of the Technical Committee 105 “Geomechanics: Micro to Macro”, and co-leads Working Group 1 of the COST Action ON-DEM. Dr. Cheng supervises 3 postdocs/research engineers (2 completed), 7 PhD students (1 completed), and 8 MSc students (4 completed). As a collaborator and mentor, he actively engages with industry partners and advocates for Open Science. His research contributes to multi-scale risk assessment and optimization methods for geotechnical structures under extreme loading conditions. Click here to explore his recent NWO- and EU-funded projects on earthquakes and submarine landslides.

Qualifications

PhD, Multiscale characterization of geosynthetic-reinforced soil, Hiroshima University
1 Oct 2013 → 28 Sept 2016
Award Date: 28 Sept 2016
Master, Hiroshima University
1 Oct 2011 → 28 Sept 2013
Award Date: 28 Sept 2013

Employment

Assistant Professor
MESA+ Institute
University of Twente
1 May 2022 → present

Assistant Professor
Soil MicroMechanics
University of Twente
1 May 2022 → present

Assistant Professor
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1 May 2022 → present

Research output

DEM investigation into the small-strain stiffness of bio-cemented soils

Zhang, A., Magnanimo, V., Cheng, H., Heimovaara, T. J. & Dieudonné, A. C., Oct 2024, In: *Acta geotechnica*. 19, 10, p. 6809-6823 15 p.

Effects of vegetation on the hydro-mechanical properties of the vadose zone

Anselmucci, F., Cheng, H., Fan, X., Zeng, Y. & Magnanimo, V., 2 Jul 2024, In: *E3S Web of Conferences*. 544, 16001.

Densification of visco-elastic powders during free and pressure-assisted sintering

Alvarez, J. E., Cheng, H., Luding, S. & Weinhart, T., 15 May 2024, In: *International journal of solids and structures*. 294, 112786.

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Cheng, H., Orozco, L., Lubbe, R., Jansen, A., Hartmann, P. & Thoeni, K., 2 May 2024, In: Journal of open source software. 9, 97, 4 p., 6338.

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Alvarez, J. E., Nijkamp, A. H., Cheng, H., Luding, S. & Weinhart, T., May 2024, In: Granular matter. 26, 2, 28.

The force and dynamic response of low-velocity projectile impact into 3D dense wet granular media

Zhang, X., Zhao, H., Cheng, H., Wang, X. & Zhang, D., 1 Feb 2024, In: Powder technology. 434, 12 p., 119309.

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Anselmucci, F. A. R., Cheng, H., Fan, X., Zeng, Y. & Magnanimo, V., Sept 2023, *Proceedings of the 8th International Symposium on DEFORMATION CHARACTERISTICS OF GEOMATERIALS Porto, 3rd - 6th September 2023*. International Society for Soil Mechanics and Geotechnical Engineering

Trending topics in computational mechanics of granular materials: from fundamentals to applications

Ye, X. & Cheng, H., 18 Jan 2023, In: Acta Mechanica Sinica/Lixue Xuebao. 39, 1, 722903.

Concurrent multi-scale modeling of granular materials: Role of coarse-graining in FEM-DEM coupling

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CG-enriched concurrent multi-scale modeling of dynamic surface interactions between discrete particles and solid continua

Cheng, H., Luding, S. & Weinhart, T., Jan 2023, In: Acta Mechanica Sinica/Lixue Xuebao. 39, 1, 722218.

Down to the root of vegetated soil: challenges and the state-of-the-art

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弹性波穿越土工袋传播规律的数值模拟

Jia, F., Liu, S. & Cheng, H., 25 Nov 2022, In: Journal of Hohai University. 50, 6, p. 108-113 6 p.

Continuum-DEM modelling of fluid-solid transition in weakly compacted systems of polydisperse particles of varying shapes

Lubbe, R., Magnanimo, V., Luding, S., Cheng, H. & Gupta, P., Oct 2022. 1 p.

Noise and Vibration in Wet Soil: Micromechanical modelling for smart mitigation strategies

Joseph, S., Luding, S., Magnanimo, V., Cheng, H. & Harting, J., Oct 2022. 1 p.

Quantifying hydro-mechanical properties of vegetated soil

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Trends and Challenges in "Machine Learning" (Workshop 1)

Rocha, I., Abdelmalik, M., Cheng, H. & Maresca, F., Oct 2022, *Twenty-fifth Engineering Mechanics Symposium, October 25-October 26, 2022. Hotel Papendal, Arnhem*. van Outvorst, R. A. M. F. & van Litsenburg, A. J. J. T. (eds.). Eindhoven University of Technology, p. 14-14 1 p.

Simulation-guided optimization of granular phononic crystal structure using the discrete element method

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On the use of coarse-graining to bridge the discrete and continuum descriptions of granular materials
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Bayesian calibration of GPU-based DEM meso-mechanics Part I: Parallelization of RVEs
Lubbe, R., Xu, W. J., Zhou, Q. & Cheng, H., Jul 2022, In: Powder technology. 407, 117631.

Bayesian Calibration of GPU-based DEM meso-mechanics Part II: Calibration of the granular meso-structure
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关于采用粗粒化提高颗粒材料多尺度模拟守恒特性的研究

Cheng, H. & Weinhart, T., 28 Jun 2022, In: Jisuan Lixue Xuebao/Chinese Journal of Computational Mechanics. 39, 3, p. 373-380 8 p.

Impact of wetting-drying cycles on the hydro-mechanical behaviour of vegetated soil
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Performance study of iterative Bayesian filtering to develop an efficient calibration framework for DEM
Hartmann, P., Cheng, H. & Thoeni, K., Jan 2022, In: Computers and Geotechnics. 141, 104491.

Visco-elastic sintering kinetics in virgin and aged polymer powders

Alvarez, J. E., Snijder, H., Vaneker, T., Cheng, H., Thornton, A. R., Luding, S. & Weinhart, T., Jan 2022, In: Powder technology. 397, 117000.

Use of DEM in geomechanics: Special issue associated with the DEM 8 conference

O'Sullivan, C., Cheng, H. & Zhao, J., Sept 2021, In: Computers and Geotechnics. 137, 104167.

Direct numerical simulation of wave propagation in saturated random granular packings using coupled LBM-DEM

Cheng, H., Luding, S., Harting, J. & Magnanimo, V., 7 Jun 2021, *Powders & Grains 2021 – 9th International Conference on Micromechanics on Granular Media*. 14003. (EPJ Web of Conferences; vol. 249).

Elastic wave velocity and attenuation in granular material

Jia, F., Cheng, H., Liu, S. & Magnanimo, V., 7 Jun 2021, *Powders & Grains 2021 – 9th International Conference on Micromechanics on Granular Media*. (EPJ Web of Conferences; vol. 249).

Failure in granular materials based on acoustic tensor: a numerical analysis

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Neck growth kinetics during polymer sintering for powder-based processes

Alvarez Naranjo, J. E., Cheng, H., Snijder, H., Vaneker, T., Luding, S. & Weinhart, T., 7 Jun 2021, *Powders & Grains 2021 – 9th International Conference on Micromechanics on Granular Media*. (EPJ Web of Conferences; vol. 249).

Bayesian Uncertainty Quantification for Geomechanical Models at Micro and Macro Scales

Cheng, H., Magnanimo, V., Shuku, T., Luding, S. & Weinhart, T., 15 Jan 2021, *Challenges and Innovations in Geomechanics: Proceedings of the 16th International Conference of IACMAG - Volume 1*. Barla, M., Di Donna, A. & Sterpi, D. (eds.). Cham: Springer, p. 837-845 9 p. (Lecture Notes in Civil Engineering; vol. 125).

DEM simulation of anisotropic granular materials: elastic and inelastic behavior

Recchia, G., Magnanimo, V., Cheng, H. & La Ragione, L., 1 Nov 2020, In: Granular matter. 22, 4, 85.

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Weinhart, T., Orefice, L., Post, M., van Schroyen Lantman, M. P., Denissen, I. F. C., Tunuguntla, D. R., Tsang, J. M. F., Cheng, H., Shaheen, M. Y., Shi, H., Rapino, P., Grannonio, E., Losacco, N., Barbosa, J., Jing, L., Alvarez Naranjo, J.

E., Roy, S., den Otter, W. K. & Thornton, A. R., 1 Apr 2020, In: Computer physics communications. 249, 107129.

Elastic wave propagation in dry granular media: effects of probing characteristics and stress history

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Influence of Load Mode on Particle Crushing Characteristics of Silica Sand at High Stresses

Wu, Y., Yamamoto, H., Cui, J. & Cheng, H., 1 Mar 2020, In: International Journal of Geomechanics. 20, 3, 04019194.

Strain-accumulation mechanisms in sands under isotropic stress

Sajeva, A., Capaccioli, S. & Cheng, H., Dec 2019, In: Journal of Geophysics and Engineering. 16, 6, p. 1139-1150 12 p.

An iterative Bayesian filtering framework for fast and automated calibration of DEM models

Cheng, H., Shuku, T., Thoeni, K., Tempone, P., Luding, S. & Magnanimo, V., 15 Jun 2019, In: Computer methods in applied mechanics and engineering. 350, p. 268-294 27 p.

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Faster, more flexible particle simulations: The future of MercuryDPM

Thornton, A. R., Post, M., Orefice, L., Rapino, P., Roy, S., Polman, H., Shaheen, M. Y., Alvarez Naranjo, J. E., Cheng, H., Jing, L., Shi, H., Mbaziira, J., Roelplal, R. & Weinhart, T., 2019. 12 p.

Grain learning: Bayesian calibration of DEM models and validation against elastic wave propagation

Cheng, H., Shuku, T., Thoeni, K., Tempone, P., Luding, S. & Magnanimo, V., 3 Aug 2018, *Proceedings of China-Europe Conference on Geotechnical Engineering. Volume 1*. Wu, W. & Yu, H.-S. (eds.). Vienna, Austria: Springer, p. 132-135 4 p. (Springer Series in Geomechanics and Geoengineering).

An iterative sequential Monte Carlo filter for Bayesian calibration of DEM models

Cheng, H., Luding, S., Magnanimo, V., Shuku, T., Thoeni, K. & Tempone, P., 22 Jun 2018, *Numerical Methods in Geotechnical Engineering IX: Proceedings of the 9th European Conference on Numerical Methods in Geotechnical Engineering (NUMGE 2018)*. Fernandes, M. D. M. (ed.). 1 ed. London: Taylor & Francis, Vol. 1.

Probabilistic calibration of discrete element simulations using the sequential quasi-Monte Carlo filter

Cheng, H. (Corresponding Author), Shuku, T., Thoeni, K. & Yamamoto, H., Feb 2018, In: Granular matter. 20, 1, 11.

An analytical solution for geotextile-wrapped soil based on insights from DEM analysis

Cheng, H., Yamamoto, H., Thoeni, K. & Wu, Y., 1 Aug 2017, In: Geotextiles and Geomembranes. 45, 4, p. 361-376 16 p.

Calibration of micromechanical parameters for DEM simulations by using the particle filter

Cheng, H., Shuku, T., Thoeni, K. & Yamamoto, H., 30 Jun 2017, In: EPJ Web of Conferences. 140, 12011.

Bayesian calibration of microCT-based DEM simulations for predicting the effective elastic response of granular materials

Cheng, H., Pellegrino, A. & Magnanimo, V., 2017.

A Simple Multiscale Model for Granular Soils with Geosynthetic Inclusion

Cheng, H., Yamamoto, H., Guo, N. & Huang, H., 1 Aug 2016, *Proceedings of the 7th International Conference on Discrete Element Methods*. Xikui, L., Yuntain, F. & Graham, M. (eds.). Springer, p. 445-453 (Springer proceedings in physics; vol. 188).

Numerical study on stress states and fabric anisotropies in soilbags using the DEM

Cheng, H., Yamamoto, H. & Thoeni, K., Jun 2016, In: Computers and Geotechnics. 76, p. 170-183 14 p.

Evaluating the Performance of Geotextile Wrapped/Layered Soil: A Comparative Study Using the DEM
Cheng, H. & Yamamoto, H., 2016, *Geo-China 2016: Geosynthetic Civil Infrastructure, Disaster Monitoring, and Environmental Geotechnics*. Chao, S.-J., Cui, X. & Pun, K.-L. (eds.). American Society of Civil Engineers, p. 122-130 (Geotechnical special publications; vol. 261).

Discrete modeling of geotextile-wrapped soil under simple shear
Cheng, H. & Yamamoto, H., 2015, *Proceedings of the 4th International Conference on Particle-Based Methods - Fundamentals and Applications, PARTICLES 2015*. International Center for Numerical Methods in Engineering, p. 485-496 12 p.

Modeling microscopic behavior of geotextile-wrapped soil by discrete element method
Cheng, H. & Yamamoto, H., 2015, In: Japanese Geotechnical Society Special Publication. p. 2215-2220 6 p.

Activities

Generalized Particle-Continuum Coupling Methods for Multi-Physical Processes in Granular Materials
Cheng, H. (Keynote speaker), Alvarez Naranjo, J. E. (Contributor), Luding, S. (Contributor), Hazel, A. L. (Contributor) & Weinhart, T. (Contributor)
9 Oct 2023

From Granular Randomness to Predictive Digital Twins: Integrating Data-Driven and Coupled Models for Uncertainty Quantification
Cheng, H. (Keynote speaker)
20 Sept 2023

Multi-scale modeling of thermo-mechanically coupled processes in granular materials
Cheng, H. (Contributor), Alvarez Naranjo, J. E. (Speaker), Luding, S. (Contributor), Hazel, A. L. (Contributor) & Weinhart, T. (Contributor)
6 Jun 2023

3rd Doctoral School of the TUSAIL Innovative Training Network 2022
Cheng, H. (Reporter)
16 Nov 2022

15th World Congress on Computational Mechanics, WCCM 2022
Cheng, H. (Organiser), Thoeni, K. (Organiser), Zhang, X. (Organiser) & Magnanimo, V. (Organiser)
31 Jul 2022 → 5 Aug 2022

Generalized FEM-DEM coupling for multi-scale modeling of granular materials using coarse-graining
Cheng, H. (Keynote speaker), Luding, S. (Contributor), Thornton, A. R. (Contributor), Hazel, A. L. (Contributor) & Weinhart, T. (Contributor)
30 Jul 2022 → 5 Aug 2022

8th International Conference on Discrete Element Methods, DEM 2019
Cheng, H. (Organiser)
21 Jul 2019 → 26 Jul 2019

Direct simulation of wave propagation in fully saturated granular packings using coupled LBM-DEM
Cheng, H. (Speaker), Luding, S. (Contributor), Harting, J. (Contributor) & Magnanimo, V. (Contributor)
21 Jul 2019 → 26 Jul 2019

GrainLearning: an efficient Bayesian uncertainty quantification framework for discrete element simulations of granular materials
Cheng, H. (Speaker), Shuku, T. (Contributor), Weinhart, T. (Contributor) & Luding, S. (Contributor)

21 Jul 2019 → 26 Jul 2019

Uncertainty quantification and propagation for multi-scale models of geomaterials : an iterative Bayesian approach

Cheng, H. (Speaker)

5 Mar 2019

Direct numerical simulation of wave propagation in dry and saturated granular media

Cheng, H. (Speaker)

28 Feb 2019

Computers and Geotechnics (Journal)

Cheng, H. (Guest Editor)

2019 → ...

Discrete element method for modeling wave propagation in dry and saturated granular media

Cheng, H. (Speaker)

11 Sept 2018

Coupled subpore-scale hydro-mechanical modeling of wave propagation in saturated granular media

Cheng, H. (Speaker), Luding, S. (Contributor), Rivas, N. (Contributor), Harting, J. (Contributor) & Magnanimo, V. (Contributor)

29 May 2018 → 1 Jun 2018

A Bayesian calibration toolbox for YADE

Cheng, H. (Speaker), Shuku, T. (Contributor), Thoeni, K. (Contributor), Luding, S. (Contributor) & Magnanimo, V. (Contributor)

26 Apr 2018 → 27 Apr 2018

Geosynthetics International (Journal)

Cheng, H. (Reviewer)

7 Sept 2017

International journal of hydrogen energy (Journal)

Cheng, H. (Reviewer)

29 Apr 2017 → ...

Granular matter (Journal)

Cheng, H. (Reviewer)

28 Feb 2017 → ...

Prizes

Best student paper award at the 7th International Conference on Discrete Element Methods

Cheng, H. (Recipient), Aug 2016

IACMAG Excellent Paper: Junior

Cheng, H. (Recipient), 30 Aug 2022

Japanese Government (Monbukagakusho) Scholarship

Cheng, H. (Recipient), Oct 2011

Top 5 downloaded articles in 2018 in Granular Matter

Cheng, H. (Recipient), Shuku, T. (Recipient), Thoeni, K. (Recipient) & Yamamoto, H. (Recipient), 25 Apr 2019

